Claims

[c1] 1. A method for decreasing gradient field pulse sequence duration and reducing peripheral nerve stimulation with known gradient pulse areas for a magnetic resonance imaging system, the method comprising:

receiving a first desired area corresponding to a first pulse;

obtaining a second desired area corresponding to a second pulse;

selecting said first pulse as a nested pulse if said first desired area is smaller than said second desired area, and establishing said second pulse as a nesting pulse, otherwise selecting said second pulse as said nested pulse and establishing said first pulse as said nesting pulse;

determining an amplitude and pulse duration for said nested pulse;

ascertaining an amplitude and pulse duration for said nesting pulse; and

arranging a plurality of gradient field pulse sequences to include said nested pulse and said nesting pulse.

[c2] 2. The method of Claim 1 wherein said determining further comprises:

establishing if said nested pulse is triangular or trapezoidal and establishing a flat top time for said nested pulse if it is trapezoidal; and

calculating said amplitude a ramp time for said nested pulse.

[c3] 3. The method of Claim 1 wherein said calculating comprises:

setting a first duration corresponding to said nested pulse equivalent to about a second duration corresponding to a flattop portion of said nesting pulse; and

calculating said amplitude a ramp time for said nesting pulse.

[c4] 4. The method of Claim 1 wherein said first pulse is a slice select rephaser pulse and said second pulse is a readout prephaser pulse.

[c5] 5. The method of Claim 1 wherein said first pulse is a readout prephaser pulse and said second pulse is a slice select rephaser pulse.

[c6] 6. The method of Claim 1 wherein said plurality of gradient field pulse sequences includes a slice select pulse sequence, a phase encoding pulse sequence and a readout pulse sequence.

[c7] 7. The method of Claim 6 wherein: said slice select pulse sequence comprises a

slice select pulse, a slice select rephaser pulse and a slice select dephaser pulse; said phase encoding pulse sequence includes a phase encoding pulse and a phase encoding rewinder pulse; and said readout pulse sequence includes a readout prephaser pulse, a readout pulse and a readout dephaser pulse.

[c8]   8. The method of Claim 7 wherein said slice select dephaser pulse is configured to be about equivalent to said slice select rephaser pulse.

[c9]   9. The method of Claim 7 wherein said phase encoding rewinder pulse is configured to be about equivalent to said phase encoding pulse but of opposite sign.

[c10]   10. The method of Claim 7 wherein said readout dephaser pulse is configured to be about equivalent to said readout prephaser pulse.

[c11]   11. The method of Claim 1 further including determining an amplitude and duration for a slice select pulse and a readout pulse responsive to a desired area for said slice select pulse and another desired area for said readout pulse.

[c12]   12. The method of Claim 11 wherein said arranging includes configuring said plurality of gradient field pulse sequences to reduce a gradient field pulse sequence duration and maintain established magnetic field constraints.

[c13]   13. The method of Claim 1 further including a third desired area corresponding to a third pulse, wherein said plurality of gradient field pulse sequences includes an initial slew of said third pulse which is occurs during a non-slewing portion of said nested pulse.

[c14]   14. The method of Claim 13 further including computing an amplitude and duration of said third pulse responsive to said third desired area.

[c15]   15. The method of Claim 14 wherein said computing comprises:
establishing if said third pulse is triangular or trapezoidal and establishing a flat top time for said third pulse if it is trapezoidal; and
calculating said amplitude a ramp time for said third pulse.

[c16]   16. The method of Claim 13 said third pulse is a phase encoding pulse.

[c17]   17. A system for decreasing gradient field pulse sequence duration and reducing peripheral nerve stimulation with known gradient pulse areas in a magnetic resonance imaging system, comprising:

a magnetic resonance imaging system including system control configured to implement a method comprising:

receiving a first desired area corresponding to a first pulse;

obtaining a second desired area corresponding to a second pulse;

selecting said first pulse as a nested pulse if said first desired area is smaller than said second desired area, and establishing said second pulse as a nesting pulse, otherwise selecting said second pulse as said nested pulse and establishing said first pulse as said nesting pulse;

determining an amplitude and pulse duration for said nested pulse;

ascertaining an amplitude and pulse duration for said nesting pulse; and

arranging a plurality of gradient field pulse sequences to include said nested pulse and said nesting pulse.

[c18]   18. The system of Claim 17 wherein said determining further comprises:
establishing if said nested pulse is triangular or trapezoidal and establishing a flat top time for said nested pulse if it is trapezoidal; and
calculating said amplitude a ramp time for said nested pulse.

[c19]   19. The system of Claim 17 wherein said calculating comprises:
setting a first duration corresponding to said nested pulse equivalent to about a second duration corresponding to a flattop portion of said nesting pulse; and
calculating said amplitude a ramp time for said nesting pulse.

[c20]   20. The system of Claim 17 wherein said first pulse is a slice select rephaser pulse and said second pulse is a readout prephaser pulse.

[c21]   21. The system of Claim 17 wherein said first pulse is a readout prephaser pulse and said second pulse is a slice select rephaser pulse.

[c22]   22. The system of Claim 17 wherein said plurality of gradient field pulse sequences includes a slice select pulse sequence, a phase encoding pulse sequence and a readout pulse sequence.

[c23]   23. The system of Claim 22 wherein: said slice select pulse sequence comprises a slice select pulse, a slice select rephaser pulse and a slice select dephaser pulse; said phase encoding pulse sequence includes a phase encoding pulse and a phase encoding rewinder pulse; and said readout pulse sequence includes a readout prephaser pulse, a readout pulse and a readout dephaser pulse.

[c24]   24. The method of Claim 23 wherein said slice select dephaser pulse is configured to be about equivalent to said slice select rephaser pulse.

[c25]   25. The method of Claim 23 wherein said phase encoding rewinder pulse is configured to be about equivalent to said phase encoding pulse but of opposite sign.

[c26]   26. The system of Claim 23 wherein said readout dephaser pulse is configured to be about equivalent to said readout prephaser pulse.

[c27]   27. The system of Claim 17 further including determining an amplitude and duration for a slice select pulse and a readout pulse responsive to a desired area for said slice select pulse and another desired area for said readout pulse.

[c28]   28. The system of Claim 27 wherein said arranging includes configuring said plurality of gradient field pulse sequences to reduce a gradient field pulse sequence duration and maintain established magnetic field constraints.

[c29]   29. The system of Claim 17 further including a third desired area corresponding to a third pulse, wherein said plurality of gradient field pulse sequences includes an initial slew of said third pulse which is occurs during a non–slewing portion of said nested pulse.

[c30]   30. The system of Claim 29 further including computing an amplitude and duration of said third pulse responsive to said third desired area.

[c31]   31. The system of Claim 30 wherein said computing comprises:
establishing if said third pulse is triangular or trapezoidal and establishing a flat top time for said third pulse if it is trapezoidal; and
calculating said amplitude a ramp time for said third pulse.

[c32]   32. The system of Claim 29 said third pulse is a phase encoding pulse.

[c33]   33. A storage medium encoded with a machine-readable computer program
          code;
          said code including instructions for causing a computer to implement a method
          for decreasing gradient field pulse sequence duration and reducing peripheral
          nerve stimulation with known gradient pulse areas for a magnetic resonance
          imaging system, the method comprising:
          receiving a first desired area corresponding to a first pulse;
          obtaining a second desired area corresponding to a second pulse;
          selecting said first pulse as a nested pulse if said first desired area is smaller
          than said second desired area, and establishing said second pulse as a nesting
          pulse, otherwise selecting said second pulse as said nested pulse and
          establishing said first pulse as said nesting pulse;
          determining an amplitude and pulse duration for said nested pulse;
          ascertaining an amplitude and pulse duration for said nesting pulse; and
          arranging a plurality of gradient field pulse sequences to include said nested
          pulse and said nesting pulse.

[c34]   34. A computer data signal comprising code configured to cause a processor to
          implement a method for decreasing gradient field pulse sequence duration and
          reducing peripheral nerve stimulation with known gradient pulse areas in a
          magnetic resonance imaging system, the method comprising:
          receiving a first desired area corresponding to a first pulse;
          obtaining a second desired area corresponding to a second pulse;
          selecting said first pulse as a nested pulse if said first desired area is smaller
          than said second desired area, and establishing said second pulse as a nesting
          pulse, otherwise selecting said second pulse as said nested pulse and
          establishing said first pulse as said nesting pulse;
          determining an amplitude and pulse duration for said nested pulse;
          ascertaining an amplitude and pulse duration for said nesting pulse; and
          arranging a plurality of gradient field pulse sequences to include said nested
          pulse and said nesting pulse.

[c35]   35. A means for decreasing gradient field pulse sequence duration and reducing peripheral nerve stimulation with known gradient pulse areas for a magnetic resonance imaging system, the method comprising:

a means for receiving a first desired area corresponding to a first pulse;

a means for obtaining a second desired area corresponding to a second pulse;

a means for selecting said first pulse as a nested pulse if said first desired area is smaller than said second desired area, and establishing said second pulse as a nesting pulse, otherwise selecting said second pulse as said nested pulse and establishing said first pulse as said nesting pulse;

a means for determining an amplitude and pulse duration for said nested pulse;

a means for ascertaining an amplitude and pulse duration for said nesting pulse; and

a means for arranging a plurality of gradient field pulse sequences to include said nested pulse and said nesting pulse.

[c36]   36. A method for nesting gradient pulses in gradient field pulse sequences with known gradient pulse areas for a magnetic resonance imaging system, comprising:

receiving a slice select rephaser pulse desired area indicative of a desired area for a slice select rephaser pulse;

receiving a readout prephaser pulse desired area indicative of a desired area for a readout prephaser pulse;

selecting said slice select rephaser pulse as a nested pulse if said slice select rephaser pulse desired area is smaller than said readout prephaser pulse desired area, and establishing said readout prephaser pulse as a nesting pulse, otherwise selecting said readout prephaser pulse as said nested pulse and establishing said slice select rephaser pulse as said nesting pulse;

determining an amplitude and pulse duration for said nested pulse;

determining an amplitude and pulse duration for said nesting pulse; and

arranging a plurality of gradient field pulse sequences to include said nested pulse and said nesting pulse in a manner that minimizes concurrent slews of any gradient field.